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*Intraoperative ketamine increases BIS-guided sevoflurane requirements during combined general and thoracic epidural anaesthesia for major abdominal surgery.* B. AKANDO, S. LAUWICK, A. KABA, M. LAMY, J. JORIS. Department of Anesthesiology & ICM, CHU Liège, University of Liège, 4000 Liège, Belgium.

## Introduction

Epidural local anesthetic reduces sevoflurane requirements to provide adequate depth of anesthesia as measured by BIS (1). BIS monitoring can be used to titrate sevoflurane (SEVO) administration during combined general-epidural anaesthesia (1). Intraoperative ketamine (KET) enhances postoperative analgesia provided by thoracic epidural analgesia (TEA) (2), but can increase BIS scores (3). We therefore tested the hypothesis that intraoperative KET increases BIS-guided SEVO requirements during major surgery under combined general-TEA anaesthesia.

## Materials and Methods

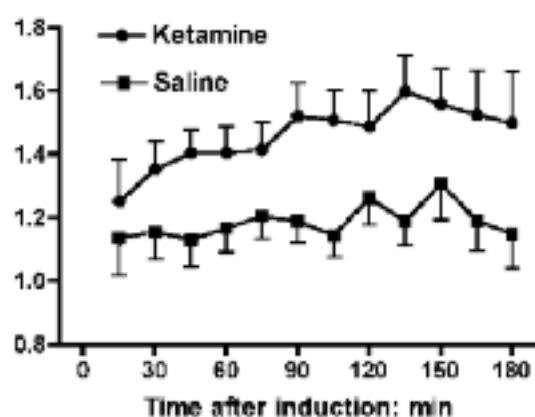
After IEC approval, 40 patients scheduled for abdominal surgery under combined general-TEA anaesthesia gave their consent to be included in this random-

ized double-blind study. TEA was standardized in all patients. After induction of anaesthesia patients were allocated in two groups : iv KET (0.5 mg/kg then infusion 0.25 mg/kg/h) or saline (SAL) given in equivolemic quantities. Anaesthesia was maintained with SEVO in O<sub>2</sub>/air. SEVO was adjusted to keep BIS scores around 50. Arterial pressure, heart rate, BIS scores, and end-tidal SEVO were recorded every 15 min. Data (mean  $\pm$  SD) were analysed using ANOVA or Students' *t* test ; *P* < 0.05 = statistical significance.

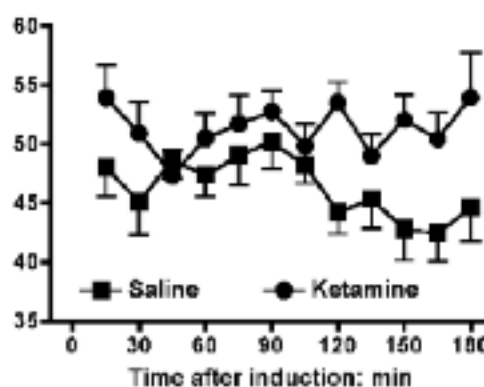
## Results

Patient demographic data were similar in the two groups. End-tidal SEVO was 20% greater (*P* < 0.01, Fig) in the KET group although BIS scores were greater in the KET group (*P* < 0.01). MAP was also lower in the KET group (70  $\pm$  15 vs 78  $\pm$  17 mmHg, *P* < 0.01).

**Sevoflurane end-tidal concentration (%)**



**BIS scores**



## Conclusions

Low intraoperative doses of KET increase BIS guided SEVO requirements during combined general-TEA anaesthesia. These results raise the question of monitoring the depth of anaesthesia when general anaesthesia is combined with TEA and KET.

## References

1. Hodgson P., *et al.*, ANESTHESIOLOGY, **94**, 799-803, 2001.
2. Suzuki M., *et al.*, ANESTHESIOLOGY, **105**, 111-9, 2006.
3. Hans P., *et al.*, BJA, **94**, 336-40, 2005.

*Effects of Multivessel Off-pump Coronary Artery Bypass Grafting (OPCAB) on Diastolic Left Ventricular (LV) Function.* E. BEKAERT, P. A. H. WYFFELS, S. VISSERS, P. SERGEANT<sup>1</sup>, P. F. WOUTERS<sup>2</sup>. Departments of Anesthesia and Cardiac Surgery<sup>1</sup>, University Hospital Leuven, Herestraat 49, 3000 Leuven and Department of Anesthesia<sup>2</sup>, University Hospital Ghent, De Pintelaan 185, 9000 Gent, Belgium.

### Introduction

During OPCAB surgery, the working heart is exposed to repetitive episodes of regional myocardial ischemia. Experimental studies have clearly shown the detrimental impact of regional ischemia and reperfusion on cardiac function (1), however, clinical data suggest that myocardial revascularization causes an immediate improvement of diastolic performance (2). We hypothesize that this paradoxical finding relates to the use of load-dependent measurement techniques. We employed tissue Doppler analysis of mitral annular (MA) velocities, currently the recommended clinical method to evaluate diastolic function (3), to prospectively study the short-term impact of OPCAB surgery on diastolic LV performance.

### Methods

The study was approved by the hospital's Ethical Committee and written informed consent was always obtained. Exclusion criteria were absence of sinus rhythm, significant valve disease and contraindications for the use of transoesophageal echocardiography (TOE). Twenty nine patients scheduled to undergo

OPCAB surgery were included. After standard anesthesia induction and installation, measurements of global hemodynamics and Doppler studies were performed immediately before surgery and repeated after skin closure. Data were obtained with the respiratory circuit briefly disconnected to exclude cardiopulmonary interaction. MA velocities were quantified both at the lateral and septal site of the annulus using color Doppler imaging at frame rates exceeding 140 frames per second (7MHz TOE probe, GE system 7 Dimension). No inotropic agents were used. For statistical analysis of paired measurements a Student's t-test was used with alpha set at 0.05 (\*).

### Results

In comparison to pre-surgical measurements, patients had a higher cardiac output, heart rate, central venous and pulmonary artery pressure and lower systemic vascular resistances after OPCAB. (Table 1) MA velocities during early diastole (E') significantly decreased and E/E' ratios increased at the lateral site but not at the septal site. No changes occurred in the systolic (S') nor atrial (A') component of MA motion at either location (Table 2).

Table 1

	preop	postop
HR bpm	58 ± 10	75 ± 12*
CO l/min	4 ± 1	5 ± 1*
ABPm mmHg	65 ± 12	64 ± 7
PAPm ~	17 ± 4	21 ± 5*
CVP ~	7 ± 3	9 ± 3*
PCWP ~	11 ± 4	12 ± 3
SVR dy.sec.cm-5	1302 ± 380	956 ± 281*
PVR ~	128 ± 52	148 ± 67

Table 2

		preop	postop
lateral	E' cm.sec-1	6.4 ± 1.8	5.3 ± 1.5*
	A' ~	5.2 ± 2.0	5.5 ± 1.7*
	S' ~	5.3 ± 1.7	5.1 ± 1.8
	E/E'	10 ± 4	14 ± 5*
septal	E' cm.sec-1	4.5 ± 1.3	4.7 ± 1.0
	A' ~	4.1 ± 1.6	3.8 ± 1.7
	S' ~	4.2 ± 1.3	4.3 ± 1.6
	E/E'	15 ± 6	16 ± 6

### Discussion

Our data show that OPCAB induces a significant decrease in peak early diastolic velocities, a finding consistent with diastolic dysfunction (3). Septal velocities do not follow the same pattern and may be less reliable to detect diastolic abnormalities in the perioperative setting. Systolic function appears well preserved after OPCAB, probably due to low afterload conditions.

### Conclusion

OPCAB produces diastolic dysfunction which may restrict fluid tolerance in patients recovering from this procedure.

### References

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2. AM. J. CARDIOL., **95**, 647-50, 2005.
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*Low-dose combined spinal epidural anesthesia for Cesarean section : neosynephrine versus ephedrine : effects on maternal hemodynamics and foetal acid base status.* C. CASTELAIN, M. VAN DE VELDE, M. KUYPERS, E. VANDERMEERSCH. Department of Anesthesiology, UZLeuven, Belgium.

### Introduction

High dose parenteral ephedrine (E), used to prevent or treat maternal hypotension during spinal anesthesia for Cesarean section (CS), is known to cause more foetal acidosis than phenylephrine (P) (1). However the effect of a limited dose of E (< 10 mg) combined with low dose combined spinal epidural anesthesia (CSE) on foetal acid base status is unknown. Low dose CSE is known to protect against hypotension, thus requiring less vasopressors (2). The present prospective, randomised trial was designed to evaluate the effect of a limited dose of E, and compare it with P, on both mother and child.

### Methodology

Following ethical committee approval and informed consent, 66 ASA I/II women carrying term pregnancies scheduled for elective C-section, were randomised to 2 groups. All patients underwent CSE anaesthesia whilst seated. The intrathecal mixture consisted of 2.5 µg sufentanil combined with 6.5 mg hyperbaric bupivacaine. In the P-group, 200 mcg of P was given prophylactically during induction of CSE anesthesia. In the E-group, 10 mg of E was given prophylactically during induction of CSE anesthesia. Hypotension was defined as a drop in systolic bloodpressure of more than 10% of baseline systolic bloodpressure. Demographic data, obstetric data, visual analogue scale (VAS) score for pain, number of anaesthetist interventions for pain, haemodynamics and neonatal outcome were recorded. Data were analysed using analysis of variance and appropriate parametric and non-parametric tests.

### Results

No differences in demographic and obstetric data were observed. Neonatal outcome was good in all groups. Hypotension was similar in the two groups. Additional P to treat hypotension was similar between the two groups. Foetal and neonatal outcome was good in both groups.

	P-group (n = 33)	E-group (n = 33)
Hypotension (n)	18	15
Number of episodes (n)	± 1.3	0.8 ± 1.0
Duration of hypotension	1.1 ± 1.2 min	0.9 ± 1.1 min
Additional P (mcg)	147 ± 139	95 ± 114
Apgar < 7 (n)	1	0
UA pH < 7.2 (n)	2	2
UA pH < 7.1 (n)	0	0
UA pH	7.301 ± 0.589	± 0.529
UA Base excess	-0.891 ± 2.076	-1.424 ± 1.694

\* p < 0.05 vs H-group, SAP : systolic blood pressure.

### Discussion

From these results we conclude that E in a dose of 10 mg has similar effects on mother and foetus when compared to P in a dose of 200 mcg when given prophylactically during induction of low dose CSE anesthesia.

### References

1. Lee, *et al.*, CAN. J. ANAESTH., **49**, 588-599, 2002.
2. Van de Velde, *et al.*, ANESTH. ANALG., 2006.

*Intravenous lidocaine reduces propofol requirement during propofol - remifentanyl anaesthesia for thyroid surgery.* V. CHARLIER, S. LAUWICK, G. HANS, A. KABA, M. LAMY, J. JORIS. Department of Anesthesiology & ICM, CHU Liège, University of Liège, 4000 Liège, Belgium.

### Introduction

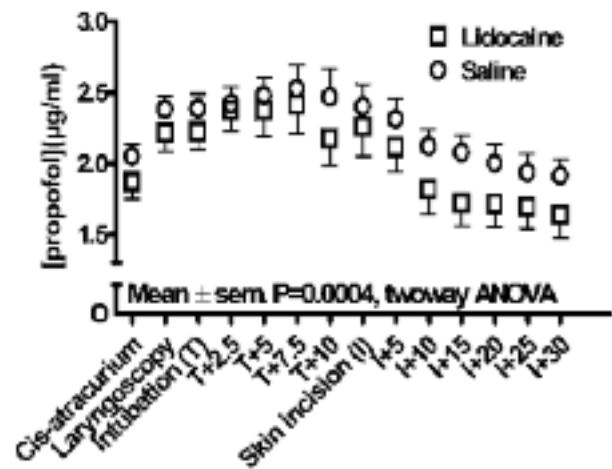
Intravenous (iv) lidocaine (LIDO) was shown to reduce volatile anaesthetic consumption (1-3). We tested the hypothesis that iv LIDO also reduces propofol requirement during total iv anaesthesia.

### Materials and Methods

After IEC approval and informed consent, 40 ASA I-II patients scheduled for thyroidectomy were enrolled in this randomised double-blind placebo-controlled study. A target-controlled infusion (TCI) of remifentanyl ( $3 \text{ ng.ml}^{-1}$ , Minto model) was started. Patients were then randomly given either iv LIDO (bolus =  $1.5 \text{ mg.kg}^{-1}$ , then  $2 \text{ mg.kg}^{-1}.\text{h}^{-1}$ ) or an equal volume of saline. After 5 min, propofol TCI was started (Schnider model) using step increases of  $0.5 \text{ } \mu\text{g.ml}^{-1}$  every 2.5 min until loss of consciousness. Cis-atracurium  $0.2 \text{ mg.kg}^{-1}$  was injected to facilitate tracheal intubation. Subsequently, propofol TCI was adjusted to keep the bispectral index (BIS) value around 50. BIS value, heart rate, arterial pressure, propofol and remifentanyl effect-site concentrations were continuously recorded up to 30 min after skin incision. Data were analysed by ANOVA.  $P \leq 0.05$  = statistically significant.

### Results and Discussion

Patient data were similar in the two groups. Intravenous lidocaine given separately does not affect BIS values. Propofol effect-site concentrations were similar in both groups during the induction of anaesthesia, endotracheal intubation, and before skin incision.



Propofol effect-site concentrations were however significantly lower in the LIDO group during surgical stimulation (Fig).

### Conclusions

Intravenous LIDO alone has no hypnotic effect. LIDO reduces BIS-guided propofol dose requirement during surgical stimulation only. These results favor an analgesic effect of iv LIDO.

### References

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2. Kuo C., *et al.*, BJA, **97**, 640-4, 2006.
3. Kaba A., *et al.*, ANESTHESIOLOGY, **106**, 11-18, 2007.

*Dose response curve of intravenous lidocaine on the depth of propofol - remifentanyl anesthesia assessed by the bispectral index (BIS) and A-line ARX index (AAI).* J. COX, G. HANS, S. LAUWICK, V. BONHOMME, P. HANS, A. KABA, J. JORIS. Department of Anesthesiology & ICM, CHU Liège, University of Liège, 4000 Liège, Belgium.

### Introduction

Intravenous lidocaine (LIDO) reduces both sevoflurane (1) and propofol (2) requirements during BIS-guided inhalational and propofol-remifentanyl anaesthesia. Whether this is due to a hypnotic or an analgesic effect of LIDO remains open. We therefore tested the effect of different doses of iv LIDO on the depth of propofol anaesthesia assessed by BIS and auditory evoked potentials using the A-line ARX index (AAI; an index of the depth of analgesia (3)) during thyroid surgery.

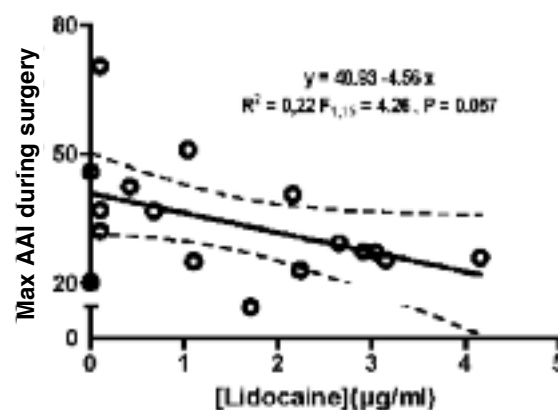
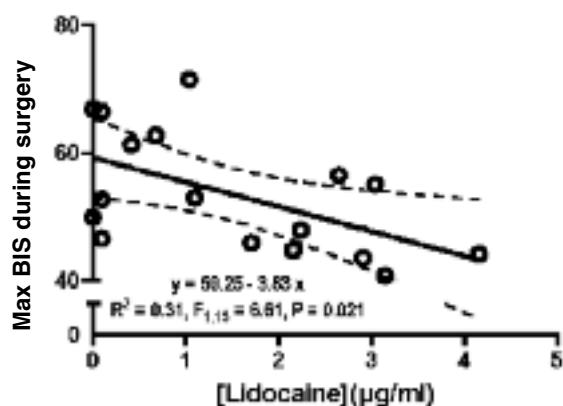
### Materials and Methods

After IRB approval and informed consent, 20 ASA I patients without medication potentially affecting BIS monitoring scheduled for elective thyroidectomy were included in this randomized double blind study. Patients were administered propofol and remifentanyl using a TCI device (Schnider's and Minto's models). Cis-atracurium was given to provide a TOF ratio = 0. After intubation

propofol was adjusted to obtain a BIS value stable around 50 and remifentanyl was set at 3 ng/ml. Just before skin incision patients were randomly allocated into four groups (n = 5 in each group): A. Saline group; B. iv LIDO bolus of 0.75 mg/kg then a continuous infusion of 1.0 mg/kg/h; C. bolus 1.5 mg/kg, infusion 2 mg/kg/h and D. bolus 3 mg/kg, infusion 4 mg/kg/h. The BIS and AAI values were continuously recorded during a 20 min LIDO infusion while propofol and remifentanyl effect site concentrations were kept constant. LIDO plasma concentrations were measured after 20 min LIDO infusion. A dose response relationship between LIDO concentration and BIS and AAI values was tested.

### Results

Patient demographic data and propofol effect site concentrations were similar in the 4 groups. There were significant relationships between LIDO concentrations and maximum BIS as well AAI.



### Conclusions

This study suggests that iv LIDO produces a dose-dependent analgesic effect. The fact that iv LIDO reduces BIS-guided propofol requirement only during surgery (2) suggests that the interaction of LIDO and BIS observed in this study results from an analgesic effect which depresses the arousal effect of surgical stimulation.

### References

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2. Charlier V., *et al.*, ACTA ANAESTHESIOLOGICA BELGICA, **59**, 2008.
3. Bonhomme V., *et al.*, BJA, **96**, 353-60, 2006.

*Effect of intravenous lidocaine on the depth of propofol anesthesia assessed by the bispectral index (BIS).* V. DELANGH, G. HANS, A. KABA, M. LAMY, J. JORIS. Department of Anesthesiology & ICM, CHU Liège, University of Liège, 4000 Liège, Belgium.

### Introduction

Intravenous (iv) lidocaine (LIDO) reduces sevoflurane (1) and propofol (2) requirements during BIS-guided inhalational and propofol-remifentanyl anaesthesia. However whether this is due to a hypnotic or an analgesic effect of LIDO remains open. We tested the effect of iv LIDO on the depth of propofol anaesthesia assessed by the BIS in a dose-dependent fashion and in the absence of surgical stimulation.

### Methods

After IEC approval and informed consent, 20 ASA I-II patients were included in this randomized double blind study. They were administered propofol using a TCI device (Schnider's model). Cis-atracurium 0.2 mg/kg was given to facilitate the insertion of a laryn-

geal mask airway. The effect-site concentration of propofol was then adjusted to obtain a BIS value stable around 50. Patients were then randomly allocated into four groups (n = 5 in each group): A. Saline group; B. iv LIDO bolus of 0.75 mg/kg followed by a continuous infusion of 1.0 mg/kg/h; C. bolus 1.5 mg/kg, infusion 2 mg/kg/h and D. bolus 3 mg/kg, infusion 4 mg/kg/h. The BIS value was continuously recorded during the 20 min LIDO administration and in the absence of surgical stimulation. LIDO plasma concentrations were measured after 20 min LIDO infusion. Data expressed as mean  $\pm$  SD were analysed by ANOVA;  $P \leq 0.05$  = statistically significant.

### Results

Changes in BIS values 20 min after saline or LIDO administration were similar in the four groups (table).

	A	B	C	D
$\Delta$ BIS ( $P = 0.9$ ).	$-8.8 \pm 8.3$	$-7.8 \pm 8.3$	$-11.7 \pm 36.1$	$-4.1 \pm 18.6$
Plasma [LIDO] : $\mu\text{g/ml}$	$< 0.1$	$0.72 \pm 0.2$	$1.7 \pm 0.4$	$3.7 \pm 0.8$

### Conclusions

In the absence of surgical stimulation, plasma concentration of LIDO up to  $3.7 \pm 0.8 \mu\text{g/ml}$  does not affect the depth of propofol anaesthesia assessed by BIS. This suggests that clinically relevant doses of iv LIDO have not proper hypnotic effect.

### References

1. Kaba *et al.*, ANESTHESIOLOGY, **106** (1), 11-8, 2007.
2. Charlier *et al.*, ACTA ANAESTHESIOL. BELG., 2008.

*Resistive-heating versus forced-air warming for prevention of redistribution hypothermia : preliminary results.* C. DEMEYER<sup>1</sup>, J. L. DE WITTE<sup>1</sup>, T. DELOOF<sup>1</sup>, E. VANDERMEERSCH<sup>2</sup>. Dept. of Anesthesiology and Intensive Care Medicine<sup>1</sup>, Onze-Lieve-Vrouw Hospital, Moorselbaan 164, 9300 Aalst, Belgium ; Dept. of Anesthesiology<sup>2</sup>, University Hospitals Gasthuisberg, Katholieke Universiteit Leuven, Herestraat 49, 3000 Leuven, Belgium.

### Introduction

A rapid core-to-peripheral transfer of heat is the most important cause of hypothermia during general or neuraxial anesthesia, resulting in several morbid outcomes (1). In this study, we evaluated the efficacy of resistive-heating (RH) vs. forced-air (FA) warming, applied 30 min preoperatively for prevention of redistribution hypothermia, compared with a control group. Preliminary data are partially presented.

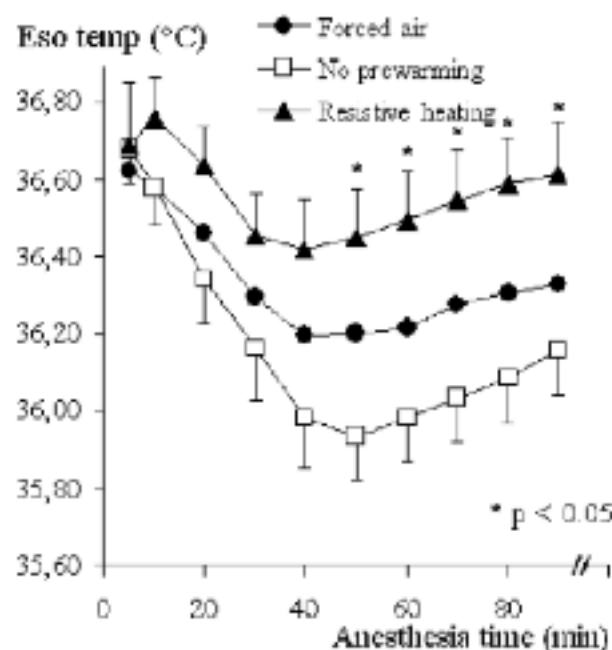
### Methods

After ethical approval and written informed consent, 24 patients scheduled for laparoscopic colorectal surgery were randomized into one of three groups : NP = no "prewarming", RH = 30 min of "prewarming" with a Geratherm® "pre-surgical" cover (carbon fiber material inside) at 42°C, or FA = 30 min of "prewarming" with Model 110 blanket and Model 750 Unit (Arizant Healthcare® Inc.) calibrated at 42°C. The usual exclusion criteria were applied.<sup>2</sup> Body temperatures (T°) were measured using Mon-a-Therm thermocouples (Tyco® Int. Ltd.) with an accuracy of  $\pm 0.1^\circ\text{C}$  and recorded electronically. Core T°, the primary endpoint, was measured at the tympanic membrane and deep oesophageal. Mean skin T° was calculated from T° at the left chest, arm, thigh, and calf. Anesthesia was induced and maintained by a TCI infusion of propofol and an infusion of remifentanyl. Intraoperatively, all patients received a Lithotomy Underbody Blanket Model 585 (Arizant®) and fluids were warmed (Ranger, Arizant®). Categorical data were analyzed using a  $\chi^2$ -test and continuous data with ANOVA.  $P < 0.05$  was considered statistically significant.

### Results

Potentially confounding factors such as ambient T°, age, body mass index, fluid balance, the use of vasopressors, and the depth of anesthesia were comparable among groups. The pre-induction tympanic T° (as means  $\pm$  SD) in the NP, RH, and FA group were  $35.89 \pm 0.51^\circ\text{C}$ ,  $35.88 \pm 0.62^\circ\text{C}$ , and  $35.73 \pm 0.58^\circ\text{C}$ , respectively. The mean duration of surgery was  $128 \pm 47$  min in the NP,  $98 \pm 48$  min in the RH group, and  $119 \pm 46$  min in the FA group. In the figure, the core T° as measured by an esophageal probe are presented as means  $\pm$  SEM. Until 90 min time elapsed, T° data were available in all patients. After 90 min of anesthesia, core T° changes in the NP, RH, and FA group were  $-0.52 \pm 0.31^\circ\text{C}$ ,  $-0.07 \pm$

$0.43^\circ\text{C}$ , and  $-0.29 \pm 0.24^\circ\text{C}$ , respectively. The difference between NP and RH was significant at 50-90 min ( $p < 0.05$ ). Mean skin T° in the NP, RH, and FA group were  $34.12 \pm 0.38^\circ\text{C}$ ,  $34.76 \pm 0.41^\circ\text{C}$ , and  $34.69 \pm 0.53^\circ\text{C}$  at 90 min respectively, being significantly different between the NP and the RH group.



### Discussion

Other authors report a comparable effectiveness of resistive-heating and forced-air warming in maintaining intraoperative core temperature (2). Although aimed for "prewarming", the Model 110 blanket covers less body surface area than the carbon fiber cover, which may explain the differences in our study.

### Conclusion

We conclude that "prewarming" with the Geratherm® "presurgical cover prevents core hypothermia more effectively compared with forced-air warming with Arizant's Preoperative Blanket M110.

### References

1. Sessler D. Mild perioperative hypothermia. N. ENGL. J. MED., **336**, 1730-7, 1997.
2. Negishi C. Resistive-heating and forced-air warming are comparable effective. ANESTH. ANALG., **96**, 1683-7, 2003.

*Low infusion rate of epidural ropivacaine through a surgically placed catheter fail to improve post-operative analgesia after lumbar laminectomy.* V. LAFORGE, J. JAMART, J. LEGAYE, V. SUARS, Ph. DUBOIS. Anaesthesia, UCL Mont Godinne, Yvoir, Belgium.

*Background and Goal of Study*

Lumbar laminectomy evoke moderate to severe pain. Although the epidural space is open during surgery and is consequently easily accessible for soft catheterization, few studies evaluate the effect of epidural anaesthesia on postoperative pain (1, 2). The goal of this study is to investigate the efficacy of ropivacaine low infusion rate to relieve postoperative pain.

*Materials and Methods*

After ethical committee approval and written informed consent, 20 patients ASA 1-2 scheduled for lumbar laminectomy spinal fusion under general anaesthesia (propofol, ketamine, rocuronium followed by sevoflurane, remifentanyl, ketorolac) were included. Before closure, the epidural catheter was inserted by the surgeon under the upper lamina. After exclusion of intrathecal injection (test dose : 3 ml lidocaine 2% with epinephrine), patients were randomised to receive either ropivacaine 0.2% (group R) or saline (group S) at 5.2 ml/h during 2 days. Each patient received 0.1 mg/kg morphine IV before the end of anaesthesia and postoperative IV PCA. Morphine consumption, rest and dynamic pain levels, side effects (hypotension, motor block, PONV) were recorded at PACU, day 1 and day 2.

Differences between groups were assessed by Wilcoxon rank sum test.

*Results and Discussion*

Both groups were similar with respect to age, sex, BMI, number of laminectomy levels and spinal fusion. No differences reach statistical significance neither for side effects nor for pain scores and morphine consumption (Table 1 and 2).

Previous studies demonstrate an analgesic effect of epidural ropivacaine 0.1% 12-14 ml/h with or without

sufentanil 1 µg/ml. In this study we failed to demonstrate a similar effect with ropivacaine 0.2 % 5 ml/h. Therefore, we may suggest to infuse a larger volume and/or to add opioids to complete effective postoperative analgesia.

VAS (moy  $\pm$  2 SD)

	Group R	Group S
D0-R	45 $\pm$ 28	41 $\pm$ 34
D0-D	42 $\pm$ 25	48 $\pm$ 32
D1-R	13 $\pm$ 17	18 $\pm$ 18
D1-D	32 $\pm$ 27	54 $\pm$ 29
D2-R	13 $\pm$ 18	13 $\pm$ 13
D2-D	28 $\pm$ 29	30 $\pm$ 29

Cumulative morphine consumption (mg)

	Group R	Group S
D0	6.0 $\pm$ 7.7	10.7 $\pm$ 11.0
D1	13.2 $\pm$ 16.5	18.5 $\pm$ 17.4
D2	24.0 $\pm$ 28.8	29.6 $\pm$ 28.7

*Conclusion(s)*

Using a 5.2 ml/h regimen of epidural ropivacaine 0.2% could not demonstrate any significant benefit on postoperative morphine consumption or VAS scores.

*References*

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3. Post-operative analgesia after lumbar laminectomy : epidural fentanyl infusion vs patient controlled intravenous morphine. ANESTH. ANALG., **80**, 511-4, 1995.



*The effect of anaesthetic technique on the incidence of Complex Regional Pain Syndrome after surgical hand fracture : Retrospective approach.* B. LEJEUNE<sup>1</sup>, S. TEUWIS<sup>1</sup>, J. P. LECOQ<sup>1</sup>, M. LAMY<sup>1</sup>, A. CARLIER<sup>2</sup>, J. P. DELEUZE<sup>2</sup>, P. MASSAGÉ<sup>2</sup>, R. FONTAINE<sup>1</sup>. Department of Anaesthesia and Intensive Care Medicine<sup>1</sup>, University Hospital, University of Liège, 4000 Liège, Belgium ; Service of Hand Surgery<sup>2</sup>, University Hospital, University of Liège, 4000 Liège, Belgium.

### Background

The complex regional pain syndrome (CRPS) describes a syndrome of pain, sudomotor, and / or vasomotor instability. It occurs in an extremity after any type of injury, or even spontaneously. Despite increasing research interest, little is known regarding what might be the optimal perioperative treatment strategy for preventing the occurrence of this syndrome after surgery (1). We investigated retrospectively whether the anaesthetic technique affected the incidence of postoperative CRPS using different anaesthetic techniques : intravenous regional anaesthesia (IVRA group), regional block anaesthesia (RA group) and general anaesthesia (GA group) for surgical treatment of hand fracture.

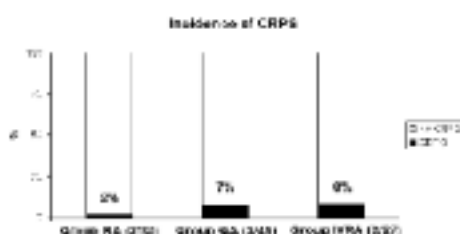
### Methods

We reviewed medical records from patients ASA physical status I-III undergoing surgery for hand fracture between 2005 and 2007. The anaesthetic technique used was based on surgeon, anaesthesiologist, and patient preferences. GA was induced with propofol and sufentanil, and maintained with N<sub>2</sub>O and sevoflurane. IVRA were established using 40 ml of lidocaine 0.5% ± Clonidine 150 µgr. Ropivacaine 0.5% ± Clonidine 150 µgr was used for wrist (8 ml) or axillary block (30ml). The diagnosis of CRPS was based on the IASP (International Association for the Study of Pain) criteria (2) and confirmed by scintigraphy. Demographic data and tourniquet time were evaluated by analysis of variance. The incidence of CRPS and gender repartition in each group was compared with the Fisher's exact test with significance  $p < 0.05$ .

### Results

We compared the medical reviews of 158 patients enrolled in our study (46 in group GA, 85 in group RA, 27 in group IVRA). Demographic data were similar between groups. Tourniquet time was significantly lower in the RA ( $27 \pm 35$  min) group when compared to the GA ( $36 \pm 38$  min) and the IVRA ( $47 \pm 17$  min) groups. 2 patients in group IVRA (8%), 3 in group GA (7%) and

2 in group RA (2%) developed clinical and scintigraphy criteria for CRPS. RA anaesthesia was associated with a non significant reduction of incidence of CRPS compared to IVRA technique (odds ratio : 0.28 – 95% CI : 0.04-2.25), or GA technique (odds ratio : 0.34 – 95% CI : 0.05-2.15). GA or IVRA techniques are associated with equivalent risk of CRPS (odds ratio : 1.14 – 95% CI : 0.18-7.34). Age, weight and sex have no influence on the risk of CRPS. Tourniquet time was significantly lower in group RA compared to group of patient developing CRPS ( $61 \pm 51$  min).



### Discussion

Notwithstanding the limitations of this retrospective approach, we observed a non significant tendency in favour of RA technique. This result is in agreement with previous study (3). Differences with this work<sup>3</sup> are explained by the definition of CRPS and the higher incidence of this syndrome after this specific surgery (fasciectomy for Dupuytren's contracture). So this can be used a starting point for a prospective randomised study. Nevertheless others factors, not including anaesthesia technique are related to the incidence of CPRS. Regarding to our results, we could not exclude the tourniquet time as a risk factor of CRPS.

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*Intraoperative low dose of ketamine improves the transition from epidural to systemic analgesia after major abdominal surgery.* L. LENELLE, S. LAUWICK, A. KABA, M. LAMY, J. JORIS. Department of Anesthesiology & ICM, CHU Liège, University of Liège, 4000 Liège, Belgium.

### Introduction

Switching from postoperative PCEA to iv PCA after abdominal surgery coincides frequently with the appearance of moderate to severe pain. This may be due to central sensitization masked during the use of epidural analgesia. Ketamine (KET) blocks central sensitization<sup>1</sup>. We investigated whether intraoperative KET decreases pain scores when switching from a PCEA mode to a iv PCA mode in the postoperative period.

### Materials and Methods

With IEC approval and informed consent, 40 patients scheduled for major abdominal surgery were included in this randomized double blind placebo-controlled study. General anaesthesia (sevoflurane in O<sub>2</sub>:air) combined with thoracic (T9-T10) epidural anaesthesia was used in all patients. After the induction of anaesthesia patients were randomly allocated in two groups (n = 20 in each group) : 0.5 mg/kg then 0.25 mg/kg/h KET or

saline (SAL). Postoperative analgesia was provided with a standardized patient-controlled epidural analgesia (PCEA) with ropivacaine 0.2% for three days postoperatively. Then PCEA was stopped and replaced by piritramide PCA. Pain scores (100 mm VAS) at rest, during mobilisation, and when coughing, consumption of ropivacaine solution and of piritramide were measured during the four first postop days. Data (mean  $\pm$  SD) were analyzed by ANOVA ; P < 0.05 = statistically significant.

### Results

Patient data and pain scores at rest were similar in the two groups. Pain scores when coughing (P < 0.01) and ropivacaine consumption (398  $\pm$  66 vs 466  $\pm$  115 mL ; P < 0.01) were significantly reduced in the KET group during PCEA. After PCEA interruption pain scores during activity (P < 0.01) and piritramide consumption during the first 24 h were significantly lower in the KET group (P = 0.03 ; table).

Time :	+ 1 h	+ 2 h	+ 4 h	+ 8 h	+ 24 h
Saline :	2 $\pm$ 2	5 $\pm$ 3	9 $\pm$ 5	16 $\pm$ 10	37 $\pm$ 25
Ketamine :	1 $\pm$ 1	4 $\pm$ 4	7 $\pm$ 6	12 $\pm$ 10	23 $\pm$ 17*

Fig. : Piritramide consumption after the interruption of PCEA ; \* P < 0.05.

### Conclusion(s)

Intraoperative small dose of ketamine significantly improves pain relief the postoperative day when switching from PCEA to iv PCA.

### Reference

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*Comparison of the ability of two pharmacokinetic-dynamic models to maintain a predicted effect-site concentration of propofol compatible with loss of consciousness.* Jurgen G. M. VAN LIMMEN, M.D., Hugo E. M. VEREECKE, M.D., Ph.D., Marc COPPENS, M.D., Eric P. MORTIER, M.D., Ph.D., Michel M. R. F. STRUYS, M.D., Ph.D. Department of anesthesia, University Hospital Gent.

### Introduction

Several pharmacokinetic-dynamic models of propofol are currently available to control commercialized target controlled infusion (TCI) pumps. We compared the Marsh (1) and Modified Schnider model (with time-to-peak-effect adaptation) (2, 3) in their ability to match the time courses of effect-site concentration and cerebral drug effects measured with BIS.

### Methods

After ethical committee approval and patient informed consent, we randomized 40 patients in two groups. Both groups received a continuous infusion of propofol at 300 ml/h until we observed "loss of response to name calling" (LORNC). Name calling was repeated every 15 seconds by the same observer. At the time of LORNC, the corresponding effect-site concentration of propofol, as calculated respectively by the Marsh (group M) or Modified Schnider model (group S), was set as a target for an effect-site controlled TCI pump, controlled by respectively Marsh (Group M) or Modified Schnider (Group S) parameters. We measured BIS-XP<sup>®</sup> (Aspect Medical Systems, Norwood, MA) in all patients during 20 minutes. Name calling was repeated every 15 seconds until the end of the study period or until "return of consciousness" (ROC) was observed.

### Results

The mean time at LORNC was respectively 163 seconds (SD +/- 30 seconds) for group M and 180 seconds (SD +/- 48 seconds) for group S. In group M, all of the patients had ROC at a mean time of 401 seconds (+/- 102 seconds) versus only one patient in group S after 233 seconds. The average BIS value at LORNC was 59 (SD +/- 12) for group M, and 66 (SD +/- 9) for group S. In group M, the mean BIS values showed no steady state condition over time (Fig. 1). In contrast, in group S (Fig. 2), mean BIS remained in steady-state after 10 minutes. However, this steady state was found at significant deeper levels of anesthesia compared to BIS values at LORNC ( $p < 0.05$ , ANOVA with Tukey-Kramer multiple comparison adjustment).

### Discussion

Our results show that targeting effect-site concentrations of propofol using the Marsh or Modified Schnider model results in significant different pharmaco-

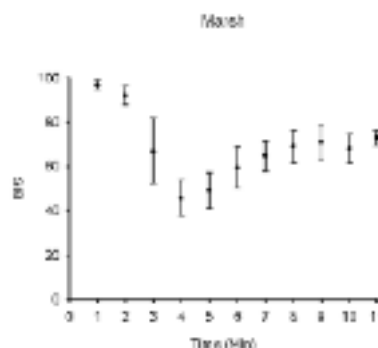


Fig. 1. — Mean BIS (+/-SD) over time in Group M

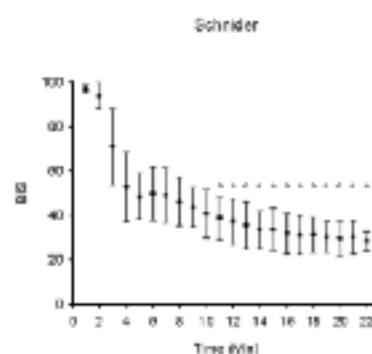


Fig. 2. — Mean BIS (+/-SD) over time in Group S

dynamic and clinical behavior. The Marsh model does not guarantee pharmacodynamic and clinical steady state anesthesia. The Modified Schnider model reaches a steady state anesthesia after 10 minutes, but only at a more pronounced level of cerebral hypnotic drug effect than targeted at first.

### Conclusions

Both PKPD models can be optimized for controlling effect-site concentrations of propofol.

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*Comparison of oesophageal temperature characteristics obtained in patients kept warm peroperatively by the Kanmed Warmcloud body warming device and the Bair Hugger Temperature Management Unit.* S. VAN PETEGHEM, K. DE JONGH, J. VAN DOORSLAER, M. HAMDI\*, M. STRUYS, K. REYNTJENS. Department of Anaesthesiology and Department of Plastic Surgery\*, University Hospital Ghent, Belgium.

### Introduction

This study aims to compare the oesophageal temperature characteristics in two patient groups. The first group was kept warm peroperatively by a new patient body warming device (Kanmed Warmcloud, Kanmed AB, Sweden), consisting of a warm air flow generator connected to an inflatable, disposable air mattress that is positioned underneath the patient. The second group used our standard patient temperature management device (Bair Hugger, Arizant Healthcare Inc., USA), consisting of a warm air flow generator connected to an inflatable, disposable air blanket that is positioned on top of the patient.

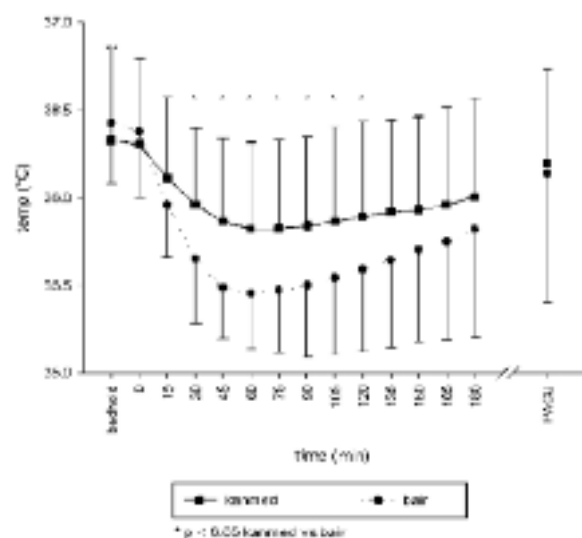
### Materials and Methods

Forty-nine patients (all female ; aged 26-68y ; BMI 18,9-33,9) undergoing unilateral or bilateral free DIEP flap breast reconstruction surgery volunteered to participate in this protocol after institutional ethics committee approval and signed informed consent. They were randomly assigned to one of the two study groups (N = 24, Kanmed ; N = 25, Bair Hugger). All patients had their tympanic temperature measured upon arrival in the bedhold area and in the post anaesthetic care unit and had an oesophageal temperature probe inserted after induction of anaesthesia. The temperature in the operating theatre was set to 20° C. The Kanmed group patients were directly positioned upon the preheated mattress (set temperature 39° C) upon arrival in the operating theatre and were covered with a simple hospital blanket. The Bair Hugger group patients were installed on the operating table and were covered with a simple hospital blanket. Only after intubation, insertion of a urinary catheter and correct positioning on the operating table, was the hospital blanket removed and the Bair Hugger air blanket (set temperature 43° C) applied. We recorded the oesophageal temperature every 15 minutes beginning at the moment of induction until arrival in the PACU.

Statistical analysis (Student's t-test) of the results was performed with SPSS v15 (SPSS Inc., USA).

### Results

The obtained oesophageal temperatures in both study groups are as shown in the figure below. We observed a better preservation of oesophageal temperature from 30 minutes till 120 minutes after induction of anaesthesia in the Kanmed group.



### Conclusions

From 30 minutes after induction of anaesthesia till 120 minutes, temperature measurements with the Kanmed Warmcloud device were statistically significantly higher than with the Bair Hugger Temperature Management Unit, suggesting that the Kanmed warming device improves preoperative temperature management.

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